

## Three new spider species of Anapidae (Araneae) from China

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**Abstract.** Three new species of the family Anapidae are reported from caves and tropical rainforest of southern China: *Gaiziapis encumensis*, *Minanapis mengluensis* and *Sinanapis longituba*. The genus *Minanapis* is recorded for the first time from China.

**Keywords:** Anapid, tropical rainforest, cave spiders, taxa

The family Anapidae was erected by Simon (1895). Anapid members are small (usually less than 3 mm in body length), three-clawed, ecribellate, haplogyne, cryptozoic spiders with six or eight eyes situated on an elevated ocular region. They usually live in leaf litter and moss on the rainforest floor and build orb webs with a diameter of less than 3 cm (Murphy et al. 2000). Some also inhabit caves. This family was redefined by Platnick and Shadab (1978, 1979). Platnick and Forster (1989) supposed that the labral spur and the glandular openings at anterolateral corners of the carapace were two synapomorphies for the family Anapidae.

The family Anapidae includes 38 genera and 150 species (Platnick 2011), distributed in tropical and southern temperate regions, such as Central and South America, Australia and Southeast Asia. The anapid species from China are insufficiently studied. Brignoli (1981) first reported an anapid species, *Pseudanapis serica* Brignoli 1981 from Hong Kong. Since then four species, *Comaroma tongjunca* Zhang & Chen 1994 (from Zhejiang), *Sinanapis crassitarsa* Wunderlich & Song 1994 (from Yunnan), *Enielkenie acaroides* Ono 2006 (from Taiwan) and *Gaiziapis zhizhuba* Miller, Griswold & Yin 2009 (from Yunnan) have been reported from China. The present paper deals with three new Chinese species of the family Anapidae based on material collected in Guangxi, Yunnan and Hainan.

### METHODS

Specimens were examined using a Leica M250 C stereomicroscope. Further details were studied under an Olympus BX51 compound microscope. All drawings were made using a drawing apparatus attached to an Olympus BX51 compound microscope, and then inked on ink jet plotter paper. Male palpi and female genitalia were examined and illustrated after they were dissected from the spiders' bodies. Vulvae of females were removed and treated in lactic acid before illustration. Male palpi and female vulvae were illustrated by incident light against a white background after being embedded in Hoyer's Solution. Type specimens are deposited in the Institute of Zoology, Chinese Academy of Sciences in Beijing (IZCAS).

All measurements were made under a Leica M250 C stereomicroscope and are given in millimeters. Leg measurements are shown as total length (femur, patella, tibia, metatarsus, and tarsus). Abbreviations used in figures are as follows: AA = apical apophysis; BA = basal apophysis; CD =

copulatory duct; Cm = cymbium; CO = copulatory opening; Co = conductor; DS = dorsal scutum; EF = epigynal furrow; Em = embolus; FA = femoral apophysis; FD = fertilization duct; Fe = femur; LS = labral spur; MA = median apophysis; PA = patellar apophysis; Pa = patella; POG = postgenital plate; S = spermatheca; Ti = tibia; Tu = tegulum and VS = ventral scutum.

### TAXONOMY

Family Anapidae Simon 1895

Genus *Gaiziapis* Miller, Griswold & Yin 2009

*Gaiziapis encumensis* new species

Figs. 1–3, 10

**Type material.**—Holotype ♂ (IZCAS), CHINA: *Guangxi*: Nandan County, Chengguan Town, Encun Village, Liangfeng Cave (25°04'N, 107°38'E), elevation 598 m, 4 March 2007, J. Liu and Y. Lin. Paratypes: 25 ♂, 30 ♀ (IZCAS), same as holotype.

**Etymology.**—The specific name refers to the type locality; adjective.

**Diagnosis.**—The new species is similar to *G. zhizhuba* in sharing the following characters: a deep anteromedian invagination on the dorsal scutum (Fig. 1B), lack of a prolateral apophysis on the palpal bulb and having a much more complicated pedipalp with more membranes and sclerites (Fig. 2B) in the male, the absence of pedipalp in the female and a round, rather than triangular, abdomen from dorsal view (Figs. 1B, D). It can be distinguished from *G. zhizhuba* by a triangular median apophysis (Figs. 1I, 2B) and an apical apophysis with coarse veins on the male palpal bulb (Figs. 1H, 2A), absence of tufted denticles on the tegulum (present in *G. zhizhuba*: Figs. 60A, 61A,C) in the male, and by the club-shaped and translucent spermathecae, the wider and weakly sclerotized copulatory ducts, and the distinctly smaller book lung covers in the female (Figs. 3A, B).

**Description.**—*Male (Holotype)*: Total length 1.20. Carapace 0.54 long, 0.44 wide, 0.60 high. Clypeus 0.22 high. Sternum 0.34 long, 0.30 wide. Abdomen 0.74 long, 0.70 wide, 0.96 high. Carapace brown, smooth, without any modification, anterolateral depressions present, small; cephalic pars risen, covered with short setae. Eight eyes in four diads, round, white; anterior median eyes smallest, other eyes subequal in size, lateral eyes adjacent. From dorsal view, both eye rows straight, same width. Thoracic groove distinct, thoracic pars granulated. Chelicerae with long setae anteriorly, fang furrow

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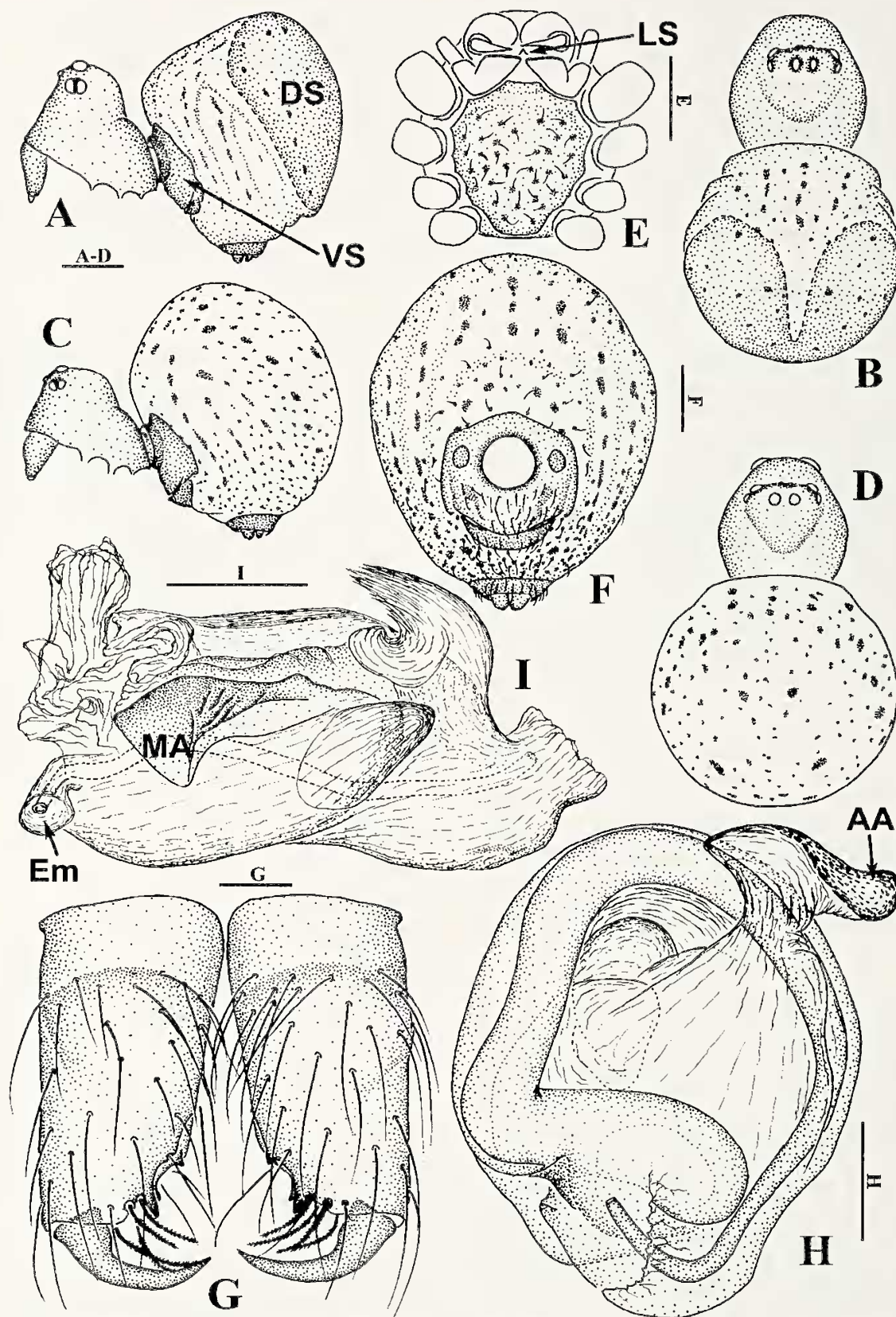


Figure 1.—*Gaiziapis encunensis* new species, holotype male and paratype female from Guangxi. A. Male body, lateral; B. Same, dorsal; C. Female body, lateral; D. Same, dorsal; E. Male sternum and coxa, ventral; F. Female abdomen, ventral; G. Male chelicerae, anterior; H. Tegulum, ventral; I. Embolic division, ventral. Scales: A–F = 0.20; G–I = 0.05.



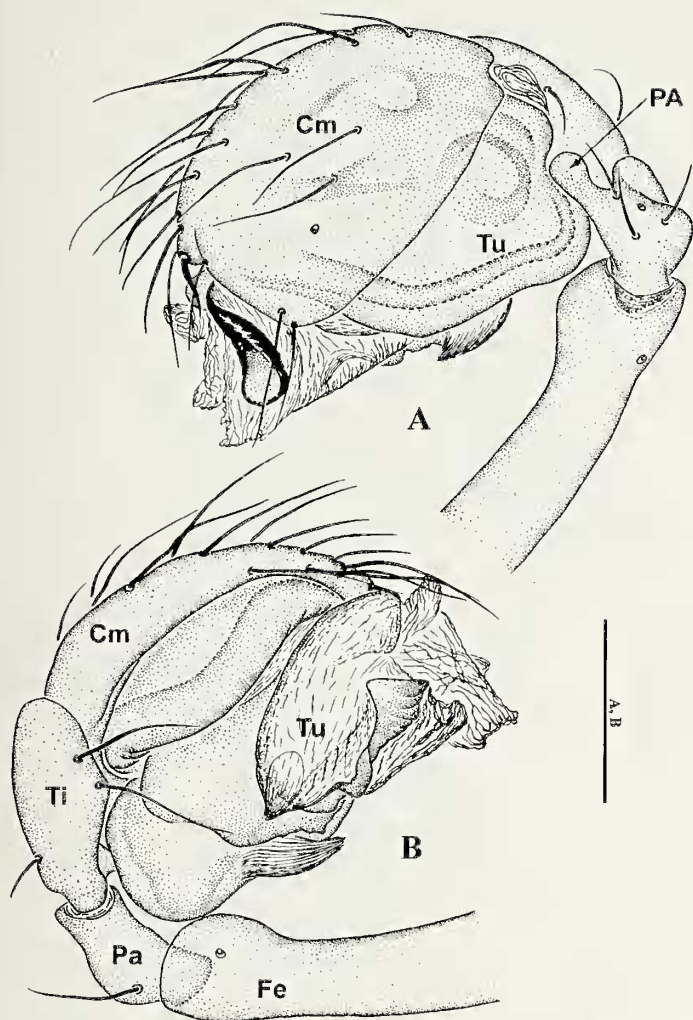


Figure 2.—*Gaiziapis encumensis* new species, holotype male from Guangxi. A. Left palp, retrolateral; B. Same, prolateral. Scale = 0.10.

with one promarginal and two retromarginal teeth; two plumose setae at promargin and retromargin separately. Labral spur present, small triangular, not furcated. Sternum brown, covered with tiny knurls and short setae. Legs yellow-brown, distal patella and middle tibia with one dorsal spine separately, tibiae with three trichobothria. Leg measurements: I 2.28 (0.78, 0.20, 0.60, 0.26, 0.44); II 1.84 (0.58, 0.16, 0.48, 0.22, 0.40); III 1.44 (0.44, 0.14, 0.34, 0.20, 0.32); IV 1.70 (0.56, 0.14, 0.44, 0.20, 0.36). Leg formula: I-II-IV-III. Abdomen round from dorsal view, covered with sclerotized spots and short setae. Dorsal scutum posterior, split at midline. Spinneret area with a sclerotized annular plate. Palpal patella with a distal retrolateral apophysis. Embolus short, embolic division with a triangular median apophysis and rugose apical lobes. Tegulum wide, with a sclerotized apical apophysis which is modified by granules (Fig. 1H). Ejaculatory duct arising on prolateral side of bulbous base.

**Female:** (one of the paratypes). Total length 1.12. Carapace 0.48 long, 0.40 wide, 0.44 high. Clypeus 0.20 high. Sternum 0.30 long, 0.28 wide. Abdomen 0.70 long, 0.78 wide, 0.90 high. Same coloration and modification on carapace as in male. Cephalic area slightly lower than in male. Anterior eye row narrower than posterior eye row. Pedipalp absent. Leg measurements: I

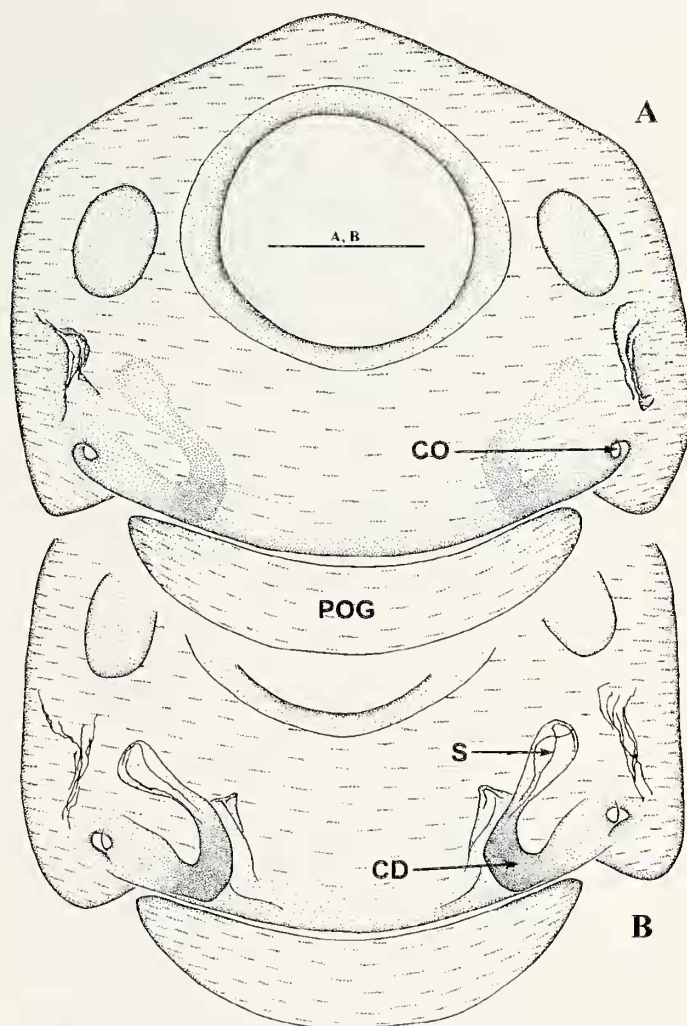


Figure 3.—*Gaiziapis encumensis* new species, paratype female from Guangxi. A. Epigynum, ventral; B. Same, dorsal. Scale = 0.10.

1.94 (0.66, 0.16, 0.52, 0.22, 0.38); II 1.66 (0.52, 0.16, 0.42, 0.20, 0.36); III 1.32 (0.40, 0.14, 0.30, 0.18, 0.30); IV 1.60 (0.52, 0.14, 0.42, 0.20, 0.18). Leg formula: I-II-IV-III. Abdomen without dorsal scutum, covered with sclerotized spots dorsally and laterally. Ventral scutum modified by wrinkles at lateral margins. Book lung covers small, ovate. Spinneret area with an annular sclerotized plate. Spermathecae relatively small, clubbed, translucent; copulatory duct curved in the middle, its proximal end fused to the retromargin of pulmonary plate; copulatory duct opens small, distinct.

**Distribution.**—Known only from the type locality (Fig. 10).

Genus *Minanapis* Platnick & Forster 1989

*Minanapis menglunensis* new species

Figs. 4–6, 10

**Type material.**—Holotype ♂ (IZCAS), CHINA: Yunnan: Mengla County, Menglun Town, rubber plantation (21°55'N, 101°17'E), elevation 556 m, 10–20 June 2007, G. Zheng. Paratypes: 7 ♂, 6 ♀ (IZCAS), the same data as for holotype.

**Etymology.**—The specific name refers to the type locality; adjective.

**Diagnosis.**—This new species is similar to these members of *Minanapis* in the absence of depressions on the anterolateral

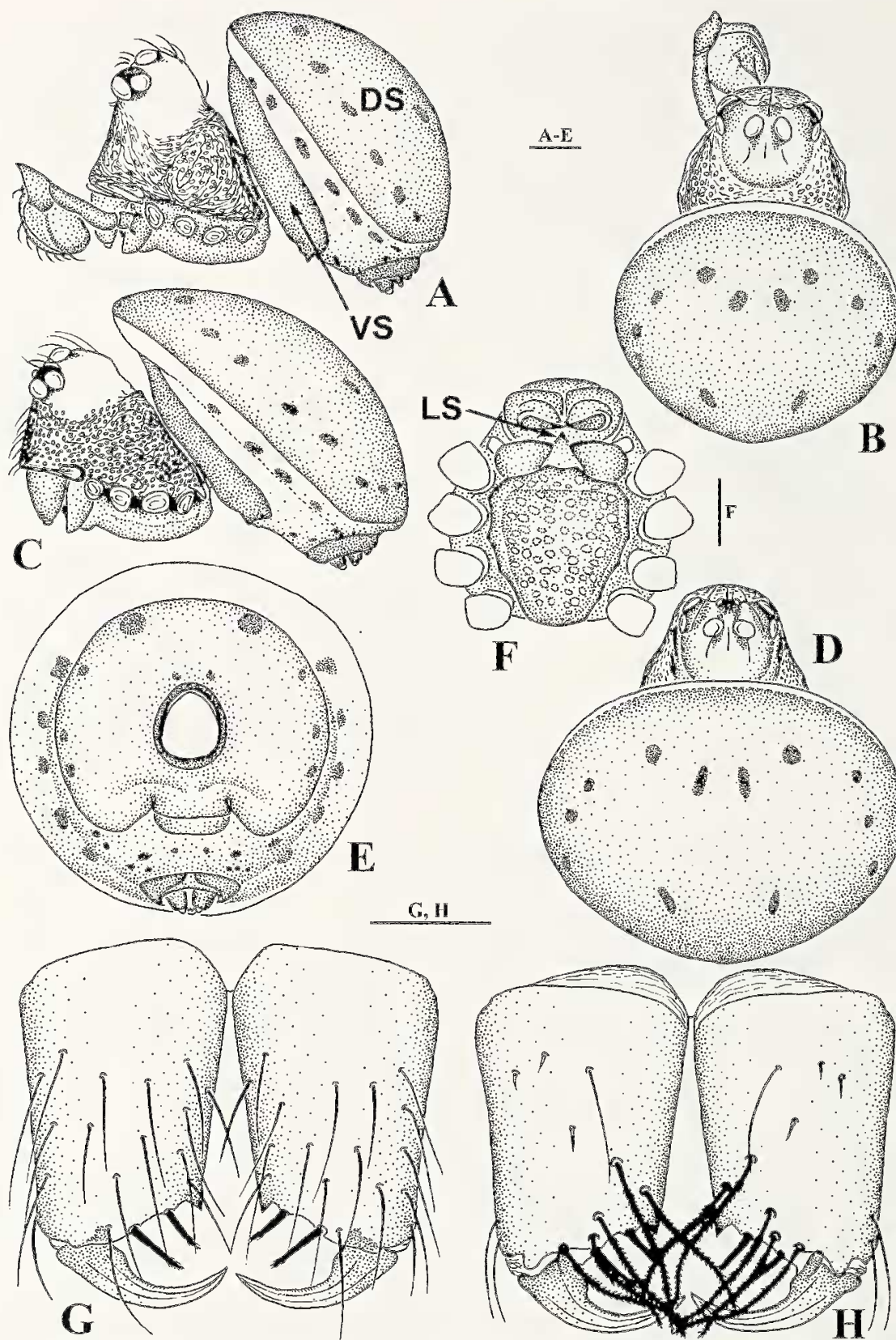


Figure 4.—*Minanapis menghunensis* new species, holotype male and paratype female from Yunnan. A. Male body, lateral; B. Same, dorsal; C. Female body, lateral; D. Same, dorsal; E. Female abdomen, ventral; F. Male sternum and coxa, ventral; G. Male chelicerae, anterior; H. Same, posterior. Scales: A–F = 0.10; G, H = 0.05.



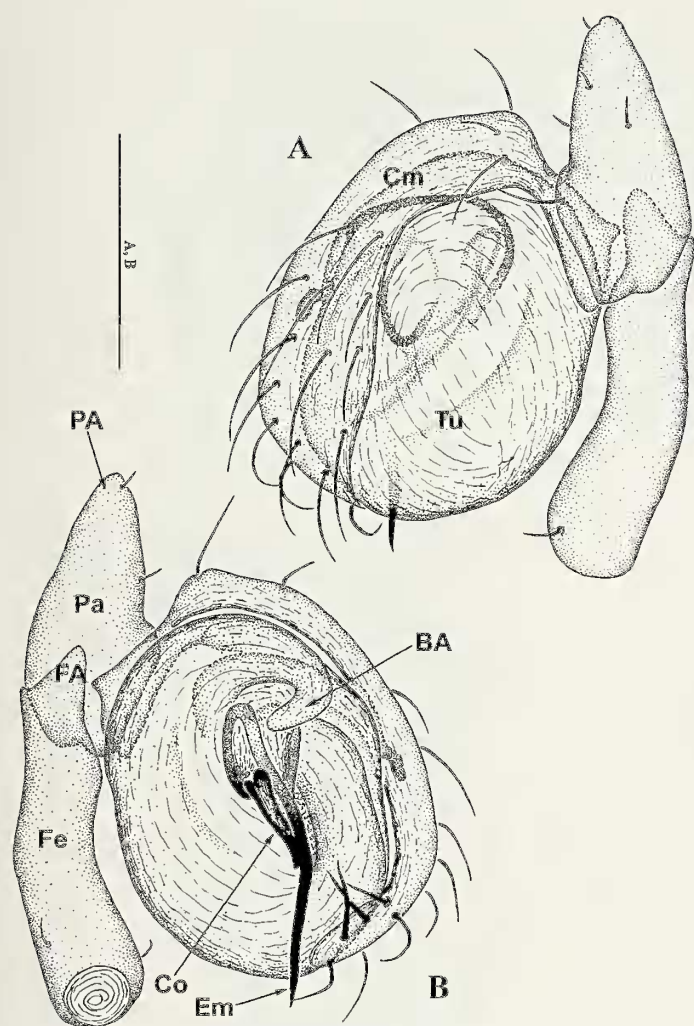


Figure 5.—*Minanapis menglunensis* new species, holotype male from Yunnan. A. Left palp, retrolateral; B. Same, prolateral. Scale = 0.10.

corners of the carapace (Figs. 4A, C), female palpal segments extending beyond the coxae, presence of anterior book lungs (Figs. 4E, 6A), male palpal patella fused to tibia, and embolus extending far out from the palpal bulb (Figs. 5A, B). It can be diagnosed from other *Minanapis* species by uncinat basal apophysis on palpal bulb, larger bulb, shorter conductor, needle-like embolus in the male (Figs. 5A, B), and by saccular, rather than sclerotized, spermathecae and very short copulatory ducts in the female (Figs. 6A, B).

**Description.**—*Male (holotype)*: Total length 0.69. Carapace 0.34 long, 0.32 wide, 0.30 high. Clypeus 0.17 high. Sternum 0.19 long, 0.17 wide. Abdomen 0.48 long, 0.54 wide. Carapace brown, anterolateral depressions present and pore-bearing; cephalic area smooth, sharply elevated, apex at ocular area; thoracic area with modified pits and rugae on posterior margin. Eyes eight, round, white, in two rows; anterior median eyes smallest, anterior lateral eyes largest, posterior eyes subequal in size. Lateral eyes adjacent. In dorsal view, anterior and posterior eye row straight, equal width. Chelicerae short, slender, covered with long hairs anteriorly and five long plumose setae posteriorly, fang furrow with a promarginal tooth and two short setae. Labral spur small, triangular, not

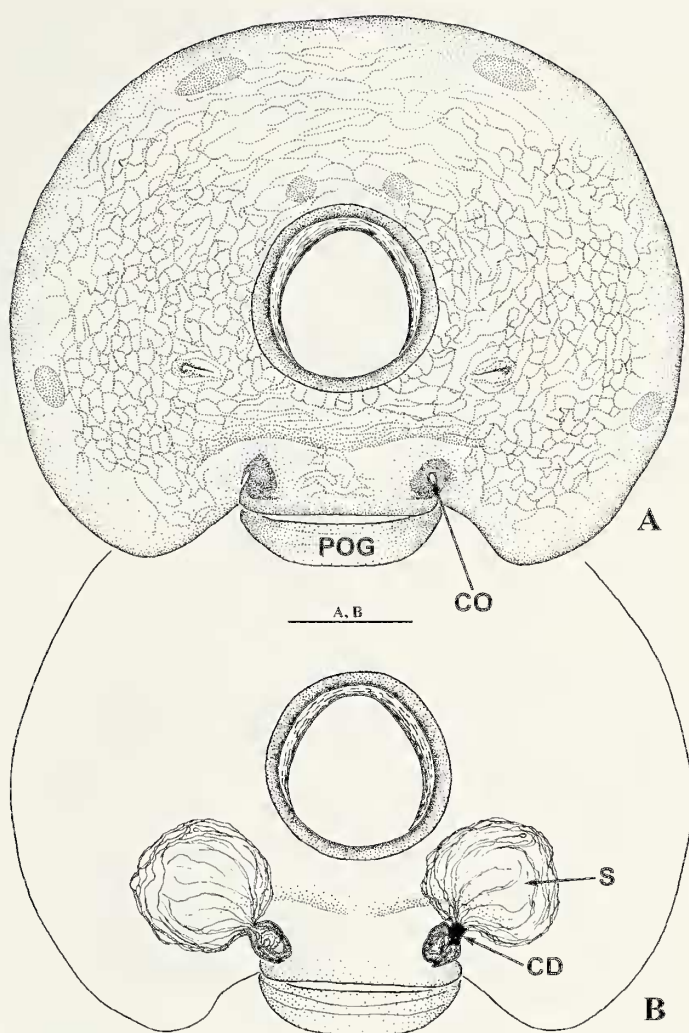


Figure 6.—*Minanapis menglunensis* new species, paratype female from Yunnan. A. Epigynum, ventral; B. Same, dorsal. Scale = 0.10.

furcated. Sternum brown, modified with pits and reticulate, margin fused to carapace between all legs. Legs yellow-brown, patella with one dorsal spine distally, tibiae I and II with two spines and three trichobothria, tibiae III and IV with one spine and three trichobothria; each metatarsus with one trichobothrium. Leg measurements: I 0.87 (0.26, 0.11, 0.19, 0.11, 0.20); II 0.80 (0.24, 0.11, 0.16, 0.10, 0.19); III 0.71 (0.21, 0.10, 0.14, 0.09, 0.17); IV 0.76 (0.23, 0.10, 0.15, 0.10, 0.18). Leg formula: I-II-IV-III. Abdomen covered with paired sclerotized spots. Dorsal scutum round. Ventral scutum present. Spinneret area with an annular scutum. Palp simple. Palpal patella with a large distal apophysis, the patella fused to tibia. Bulb elliptic, median and apical apophysis absent, only with an uncinat basal apophysis. Embolus long, tube-shaped, situated medially on bulb, extending across and beyond distal tegulum. Conductor about one third of embolus in length. Cymbium with three spines prolateral-distally.

*Female*: Total length 0.75 (one of the paratypes). Carapace 0.37 long, 0.32 wide, 0.25 high. Clypeus 0.14 high. Sternum 0.20 long, 0.20 wide. Abdomen 0.57 long, 0.68 wide. Coloration and modification same as in male. Cephalic area slightly lower than in male. Pedipalp absent. Leg measurements: I 0.83 (0.25, 0.11, 0.18, 0.10, 0.19); II 0.77 (0.22, 0.11, 0.16, 0.10,

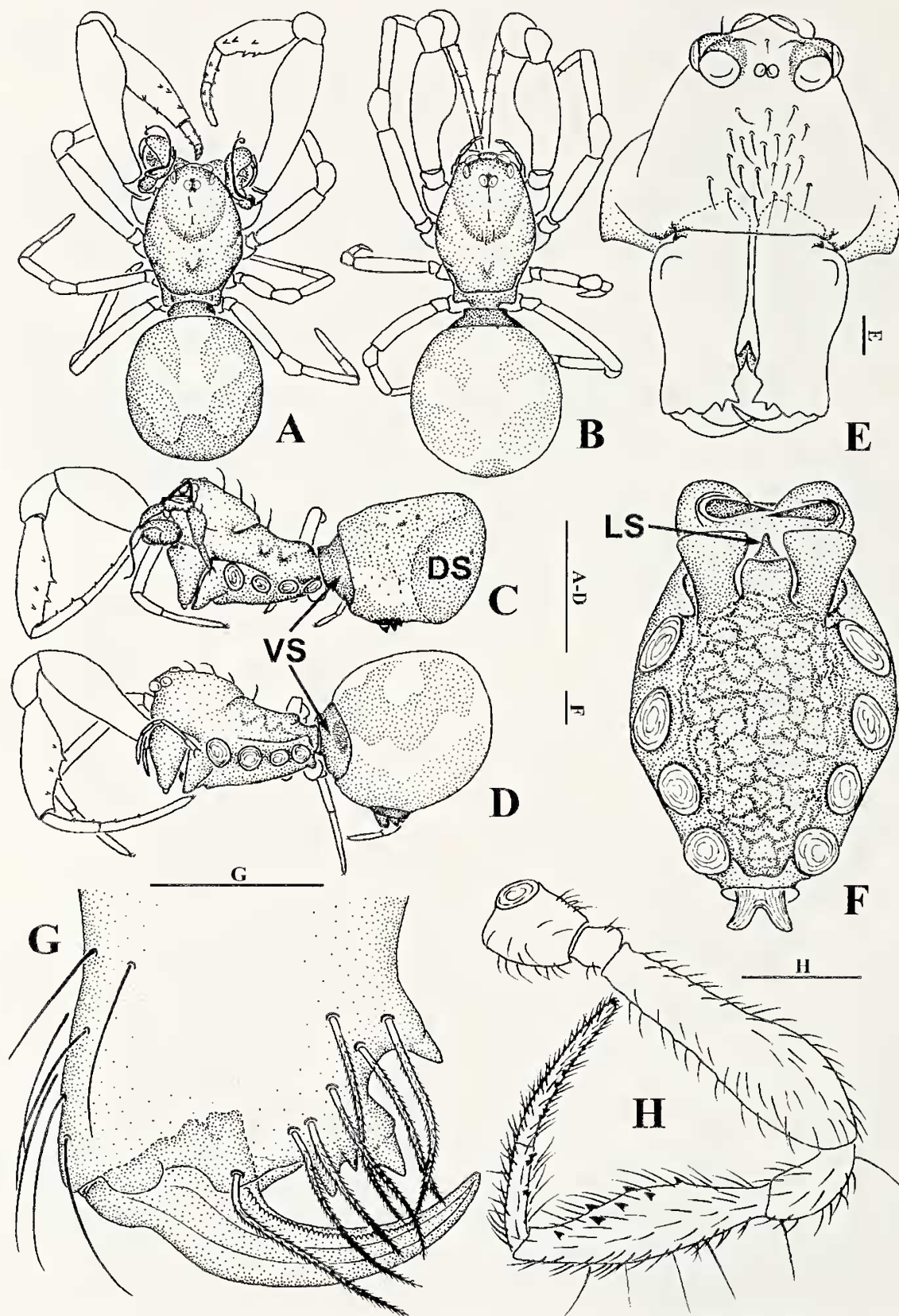


Figure 7.—*Sinanapis longituba* new species, holotype male and paratype female from Hainan. A. Male body, dorsal; B. Female body, dorsal; C. Same A, lateral; D. Same B, lateral; E. Male carapace and chelicerae, anterior; F. Male sternum, ventral; G. Left chelicera, posterior; H. Male left leg I, prolateral. Scales: A–D = 1.00; E, F = 0.10; H = 0.50.



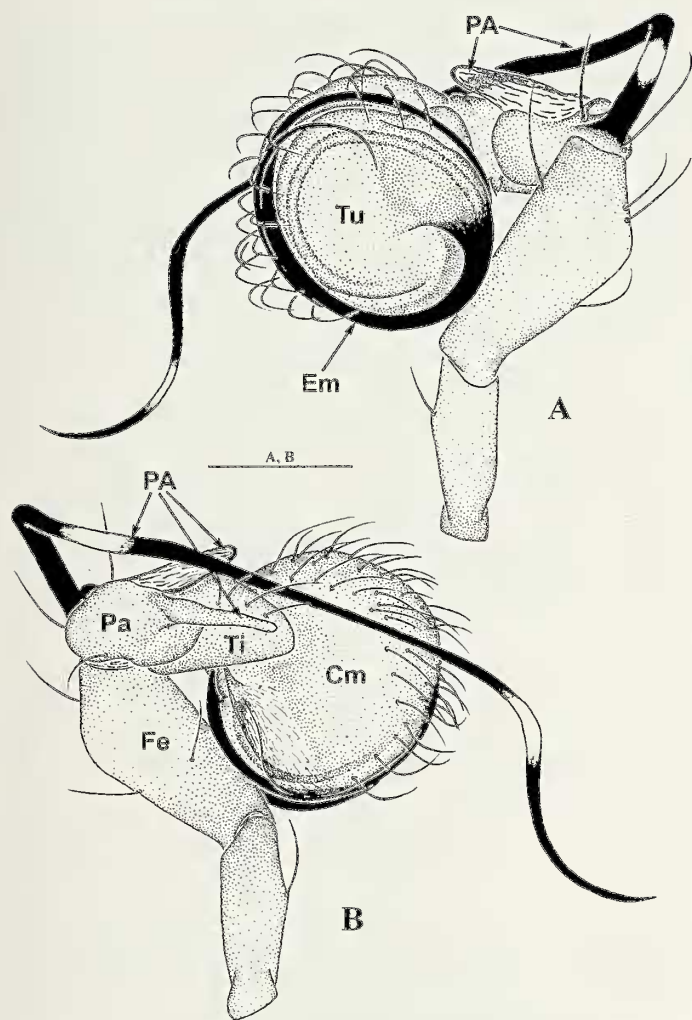


Figure 8.—*Sinanapis longituba* new species, holotype male from Hainan. A. Left palp, retrolateral; B. Same, prolateral. Scale = 0.20.

0.18); III 0.67 (0.19, 0.10, 0.13, 0.09, 0.16); IV 0.76 (0.23, 0.10, 0.16, 0.10, 0.17). Leg formula: I-II-IV-III. Abdominal dorsal scutum round. Ventral scutum reticulate, with a pair of posterolateral corners. Epigynal area wrinkled, copulatory openings distinct. Spermathecae relatively large, saccular rugosed, connected to short, sclerotized copulatory duct; copulatory openings situated at posterior surface of epigynal shield.

**Other material examined.**—1 ♂, 3 ♀ (IZCAS), CHINA: Yunnan: Mengla County, Menglun Nature Reserve, primary tropical seasonal rainforest (21°55'N, 101°16'E), elevation 558 m, 22 July 2007, G. Zheng. 5 ♂, 2 ♀ (IZCAS), Menglun Town, rubber-tea plantation (21°56'N, 101°17'E), elevation 561 m, 8–12 August 2006, G. Zheng.

**Distribution.**—Known only from the type locality (Fig. 10).

Genus *Sinanapis* Wunderlich & Song 1995

*Sinanapis longituba* new species

Figs. 7–10

**Type material.**—Holotype ♂ (IZCAS), CHINA: Hainan: male, Qiongzong County, Mt. Limushan Nature Reserve (19°11'N, 109°44'E), elevation 655 m, 12 August 2007, S. Li and C. Wang. Paratypes: 3 ♂, 11 ♀ (IZCAS), same data as for holotype.

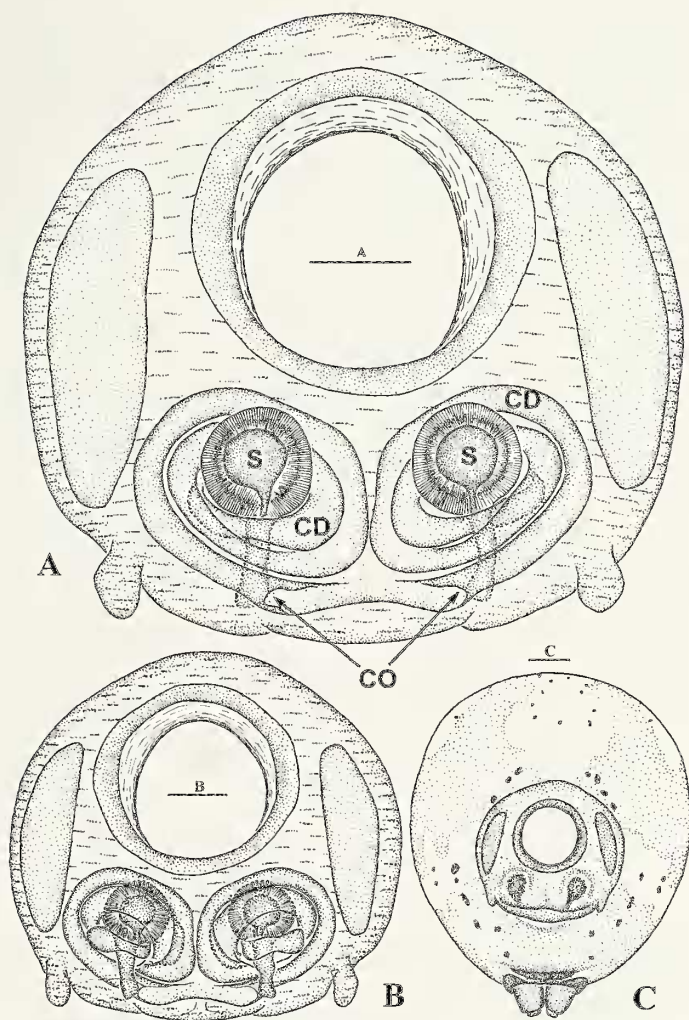


Figure 9.—*Sinanapis longituba* new species, paratype female from Hainan. A. Epigynum (treated in lactic acid), ventral; B. Same, dorsal; C. Abdomen, ventral. Scales: A, B = 0.10; C = 0.20.

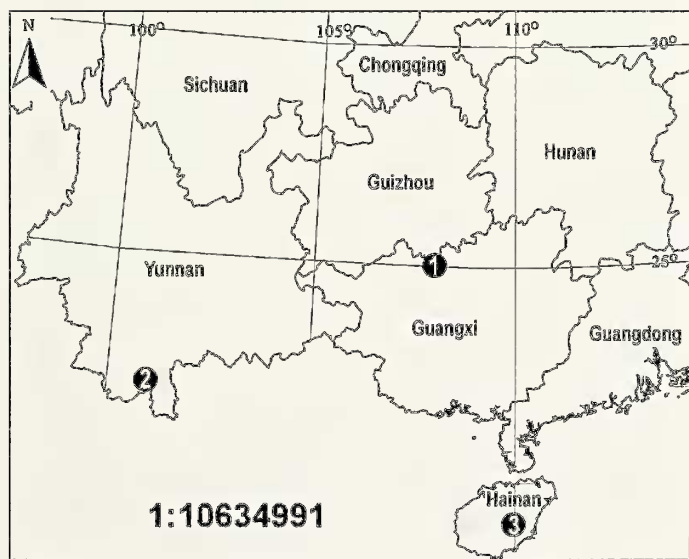


Figure 10.—Locality records of three new Chinese anapids. 1. *Gaizipis encunensis* new species; 2. *Minanapis menglunensis* new species; 3. *Sinanapis longituba* new species.

**Etymology.**—Specific epithet is derived from Latin “*longitubus*”—long-tube, referring to the presence of a long process on palpal patella of male; adjective.

**Diagnosis.**—The new species is similar to *Sinanapis crassitarsus* Wunderlich & Song 1995 and *S. thaleri* Ono 2009 in having similar body size, strong male leg I, modified cusps on metatarsus and tarsus I, and complicated patellar apophyses in the male (Figs. 7A–D, H; 8A, B), but can be distinguished from *S. crassitarsus* and *S. thaleri* by the presence of anterior median eyes (Fig. 7E), very long and sclerotized, rather than grater-like, patellar apophysis on the palp, conical bulb with coiled embolus in the male (Figs. 8A, B). Female (unknown in *S. crassitarsus* and *S. thaleri*) can be easily recognized by the longer than wide book lung covers and the two coiled copulatory ducts encircled by spherical spermathecae (Figs. 9A–C).

**Description.**—*Male (holotype)*: Total length 2.52. Carapace 1.20 long, 0.80 wide, 0.68 high. Clypeus 0.40 high. Sternum 0.90 long, 0.45 wide. Abdomen 1.20 long, 1.14 wide. Carapace red-brown, anterolateral depressions absent. Thoracic region modified with semiround pits, rugose at posterior margin; cephalic pars distinctly raised, smooth, with four setae on midline. Eight eyes in four diads, anterior median eyes smallest, anterior laterals largest, anterior median eyes separated by their diameter, posterior median eyes contiguous, larger slightly than posterior laterals in diameter. Lateral eyes adjacent. From dorsal view, anterior eye row straight, posterior eye row procurved. Chelicerae brown, with a proximally lateral knob, fang furrow with three isolated large promarginal teeth, one small retromarginal tooth and seven plumose setae posteriorly. Labral spur large, furcated at base. Sternum brown, modified with pits and reticulate. Legs brown-yellow, strong, femur I and tibia I swollen, tibia, metatarsus and tarsus of leg I with paired spurs ventrally; each patella distally with one dorsal spine and as well as on proximal of each tibia. Each tibia with four trichobothria. Leg measurements: I 4.26 (1.35, 0.48, 1.12, 0.53, 0.78); II 3.03 (0.90, 0.37, 0.71, 0.40, 0.65); III 2.15 (0.65, 0.25, 0.48, 0.30, 0.47); IV 2.57 (0.80, 0.27, 0.65, 0.36, 0.49). Leg formula: I-II-IV-III. Abdomen darkish, with a large trifoliate-light speckle on dorsum, dorsal scutum on rear, sclerotized spots on laterals. Ventral scutum present. Spinnerets with an annular sclerotized plate. Palp relatively large. Palpal trochanter subequal to two-thirds of palpal femur in length. Palpal femur swollen at one-third distally. Palpal patella with three apophyses, the retrolateral one very long and the prolateral two short. Palpal tibia without any apophysis. Palpal bulb simple, cone-shaped, without any apophyses. Embolus long, strongly sclerotized, coiled into two loops. Tegulum smooth and flat. Cymbium nearly funnelled, with long setae on the brim.

*Female*: Total length 2.43 (one of the paratypes). Carapace 1.12 long, 0.70 wide, 0.53 high. Clypeus 0.22 high. Sternum 0.87 long, 0.50 wide. Abdomen 1.30 long, 1.08 wide. Coloration and modification of body are same as in male, but abdominal dorsal scutum absent. Palp present and segmented. Leg chaetotaxy and eye pattern same as in male. Cephalic pars slightly lower than in male. Leg measurements: I

3.69 (1.15, 0.44, 0.95, 0.45, 0.70); II 2.70 (0.80, 0.33, 0.62, 0.35, 0.60); III 1.99 (0.55, 0.25, 0.43, 0.28, 0.48); IV 2.56 (0.78, 0.27, 0.61, 0.35, 0.55). Leg formula: I-II-IV-III. Abdominal patterns as in male. Ventral scutum modified by tiny stripes, with a pair of posterolateral corners. Book lung covers large, longer than wide. Spinneret area with an annular sclerotized plate. Spermathecae round, strongly sclerotized. Copulatory ducts long, coiled into two rings, opening at the posterior margin of epigynal area. Fertilization ducts short and straight, arising from the bottom of spermathecae.

**Distribution.**—Known only from the type locality (Fig. 10).

## ACKNOWLEDGMENTS

The manuscript benefited greatly from comments by Ingi Agnarsson, Xinping Wang and two anonymous reviewers. This study was supported by the National Natural Sciences Foundation of China (China National Funds for Distinguished Young Scientists-31025023 and NSFC-30870271, 31000946), and by the Doctoral Fund of Youth Scholars of the Ministry of Education of China (RFDP-20100181120049).

## LITERATURE CITED

- Brignoli, P.M. 1981. New or interesting Anapidae (Arachnida, Araneae). *Revue Suisse de Zoologie* 88:109–134.
- Forster, R.R. & N.I. Platnick. 1977. A review of the spider family Symphytognathidae (Arachnida, Araneae). *American Museum Novitates* 2619:1–29.
- Miller, J.A., C.E. Griswold & C.M. Yin. 2009. The symphytognathoid spiders of the Gaoligongshan, Yunnan, China (Araneae, Araneoidea), systematics and diversity of micro-orbweavers. *ZooKeys* 11:9–195.
- Murphy, F., J. Murphy & M.J. Roberts. 2000. An Introduction to the Spiders of South East Asia with Notes on All the Genera. Malaysian Nature Society, Kuala Lumpur.
- Ono, H., Y.H. Chang & I.M. Tso. 2006. Three new spiders of the families Theridiidae and Anapidae (Araneae) from southern Taiwan. *Memoirs of the National Science Museum, Tokyo* 44:71–82.
- Platnick, N.I. 2011. The World Spider Catalog, version 12.0. American Museum of Natural History, online at <http://research.amnh.org/entomology/spiders/catalog/index.html>
- Platnick, N.I. & R.R. Forster. 1989. A revision of the temperate South American and Australasian spiders of the family Anapidae (Araneae, Araneoidea). *Bulletin of the American Museum of Natural History* 190:1–139.
- Platnick, N.I. & M.U. Shadab. 1978. A review of the spider genus *Anapis* (Araneae, Anapidae), with a dual cladistic analysis. *American Museum Novitates* 2663:1–23.
- Platnick, N.I. & M.U. Shadab. 1979. A review of the spider genera *Anapisona* and *Pseudanapis* (Araneae, Anapidae). *American Museum Novitates* 2672:1–20.
- Simon, E. 1895. *Histoire naturelle des araignées*. Encyclopédie Roret, Paris 1:761–1084.
- Wunderlich, J. & D.X. Song. 1994. Four new spider species of the families Anapidae, Linyphiidae and Nesticidae from a tropical rain forest area of SW China. *Beiträge zur Araneologie* 4:343–351.
- Zhang, Z.H. & Z.F. Chen. 1994. A new species of the genus *Comaroma* in China (Araneae: Anapidae). *Journal of Hanzhou University (Natural Science Edition)* 21(Supplementary):118–121.

*Manuscript received 5 December 2008, revised 16 March 2012.*